tion of unwinding will be $100 + 0{\cdot}117\,t$, and the speed of the balloon will be given by the formula—

$$S = \frac{100}{t} + 0{\cdot}117.$$

The preparations above referred to having been all completed, on the first fine day thereafter, August 25, the new mechanism was put on its trial, and behaved in a manner leaving nothing to be desired.

The balloon, which had been already filled for a certain time, having lost a considerable portion of its ascending force, M. Renard was under the necessity, on this occasion, of dispensing with the services of a third aëronaut, and mounted in the company solely of his brother, Capt. Paul Renard. The wind blew from the east. The speed measured at a low height by means of small balloons, appeared to be no more than 5 metres a second. Taking as a basis the approximate values of the preceding year, they calculated on obtaining a proper speed of nearly 7 metres per second, and were greatly surprised at being unable to gain the aërial current which prevailed at 250 metres above the valley of Chalais. The spiral, launched at fifty-five rounds per minute, proceeded with perfect regularity, yet they fell back—slowly, indeed, but continually. Desiring, nevertheless, to continue the experiment, and fearing to be carried away above the woods of the Chaville quarter, M. Renard turned the head of the balloon a little to the right, and soon, under the combined action of the wind and its own speed, it took a southern direction, and, the backward movement continuing, alighted after a voyage of 50 minutes close by the farm of Villa Coublay, whither he had directed it.

By reason of the bad weather the second definitive experiment did not come off till September 22, when the wind was blowing from the north-north-east—that is, from Paris, and its velocity in the lower strata varied from 3 to 3·50 metres per second. This time the aëronauts had their full complement of three: Capt. Renard at the helm and the motory machine, Capt. Paul Renard taking measurements and various observations, and, in addition, M. Duté-Poitevin. They started at 4.25 p.m. in a moist and foggy atmosphere. The spiral was set in motion and the head directed towards Paris. Though at first inclined to yaw, the course of the balloon soon righted itself, and, crossing the railway line above the station at 4.55, the balloon reached the Seine towards the western extremity of the island of Billancourt at 5 o'clock. Here, a measurement being taken, the progress of the balloon was found to be precisely 6 metres per second (time of unwinding = 17″, whence

$$S = \frac{100}{1{\cdot}7} + 0{\cdot}117 = 5{\cdot}882 + 0{\cdot}117 = 5{\cdot}999\,\mathrm{m}\,).$$

At 5.12 p.m., after an excursion of 47 minutes, the balloon entered the enceinte by the bastion 65. It was only the increasing damp and fog which induced the aëronauts to cut short their voyage and make for home. The turning of the balloon was easily effected, and, aided this time by the aërial current, it approached its point of departure, which was entirely concealed by the fog, with surprising rapidity, retracing in 11 minutes the road it had taken 47 minutes to cover in going. The aërostat tacked about at first to keep its head to the wind, and in 10 minutes the little skiff touched the sward, whence it had ascended. During this voyage the balloon mounted to only 400 metres above the ground.

The next day before Gen. Campenon, Minister of War, and Gen. Bressonnet, President of the Committee of Fortifications, the balloon, *La France*, performed a fresh ascent with a success equal to that of the previous day. The itinerary of this voyage was much the same as that of the 22nd. The wind was weaker and bore the balloon to Paris. The time of the passage was 17 minutes going, 20 returning. The landing was very easy, and the balloon returned to the precise spot of its departure. The voyage could not be further prolonged for lack of ballast, the previous ascent having cost the balloon a partial loss of its ascending force.

On the valid basis of the experiments above described, M. Renard lays down some fundamental formulæ for calculating the resistance of balloons of construction analogous to that of *La France* with network and car.

Let R be the resistance in kilogrammes of the balloon *La France*, moving by the point; S, its speed per second in metres; θ, the work of direct traction (motory work in kilogrammetres); T, the work of the propelling screw shaft (in kilogrammetres); T', the work at the limits of the motive power in kilogrammetres); then

$$(1)\quad \left\{\begin{aligned} R &= 1{\cdot}189\,S^2. \\ \theta &= 1{\cdot}189\,S^2. \\ T &= 2{\cdot}300\,S^3. \\ T' &= 2{\cdot}800\,S^3. \end{aligned}\right.$$

At the rate of 10 metres, which would suffice for having the direction in most cases, we get

R = 118·9 kilogrammes.
θ = 1189 kilogrammetres.
T = 2300 kilogrammetres, or 31 horse-power.
T' = 2800 kilogrammetres.

In general for a balloon of D diameter (in metres) we would get

$$\begin{aligned} R &= 0{\cdot}01685\,D^2\,S^2. \\ \theta &= 0{\cdot}01685\,D^2\,S^3. \\ T &= 0{\cdot}0326\,D^2\,S^3. \\ T' &= 0{\cdot}0397\,D^2\,S^3. \end{aligned}$$

It may be added that out of seven voyages, from August 9, 1884, to September 23, 1885, the aërostat has in five returned to its point of departure.

NOTES

With much regret we announce the death of the eminent Belgian botanist, Prof. C. J. E. Morren, of Liége, at the early age of fifty-three years.

At a meeting of the Managers of the Royal Institution, held on Monday, March 1, the Actonian Prize of one hundred guineas was awarded to Prof. G. G. Stokes, P.R.S., for his lectures on Light, in conformity with the Acton Endowment Trust Deed. The following alteration has been made in the lecture arrangements before Easter:—Prof. Dewar, F.R.S., will begin a course of four lectures on Electro-Chemistry, on March 25, in place of Prof. Tyndall, F.R.S., on Light.

Dr. Julius von Haast, C.M.G., F.R.S., the eminent geologist and Director of the Canterbury Museum, New Zealand, who is charged as Commissioner with the exhibits from that colony for the Colonial and Indian Exhibition, has arrived in London, and is busily at work in carrying out all the preliminary arrangements of the extensive court allotted to New Zealand. Dr. von Haast has been exceedingly successful in his journeys through the colony in obtaining large and valuable collections illustrating the fauna, flora, and geology, as well as collections of the art and industry of the Maori tribes. The food and other fishes, the birds, the timbers, as well as other native products and local industries will be well represented.

M. Pasteur, at the last sitting of the Paris Academy of Sciences, stated that out of 325 cases of inoculation for hydrophobia, only one had failed—namely, that of the youth Pelletier, who came too long after being bitten, and under very unfavourable conditions. He advocated the establishment of an international hospital, to which patients would come from all parts of the world; and he suggested a discussion as to the locality and the fund for its support. At the close of the meeting Prof. Pasteur announced that he should next investigate whether diphtheria could not be treated by a similar process to that which he had found so successful against hydrophobia.

M. CHEVREUL caught a cold a few days ago, and some anxiety was entertained for his health, owing to his great age rather than to the gravity of the indisposition. We are glad to learn that he has since improved. His 101st birthday will take place on August 31 next.

IT is probable that the Observatory of Montsouris will be discontinued as an independent establishment. M. Marie-Davy will be placed on the retired list, and the credits paid in support of Montsouris suppressed entirely. It will become the headquarters of the Central Bureau of French Meteorology.

THE *Colonies and India* states that it is the intention of Mr. Morris, on leaving Jamaica to take up his appointment at Kew, to make a tour of the West India Islands for the purpose of becoming personally acquainted with their circumstances and resources, and with the view of being able afterwards to give them advice and assistance in the development of new industries. Several of the islands have already been visited by him, but it is said to be his intention to make now a careful study of their circumstances, to be afterwards embodied in a special report, or utilised in directing the resources of Kew to the amelioration and improvement of West Indian industries.

AT the Scottish Geographical Society on Tuesday afternoon, March 9, at 4 o'clock, a paper will be read by Prof. James Geikie, F.R.S., Vice-President of the Society, entitled "The Evolution of Europe."

THE Department of Public Works in Japan having recently been abolished as a separate office of State, much interest is felt, especially by scientific Europeans in the Japanese service, as to the future fate of the Imperial College of Engineering, which, since its establishment, has been under the control of the Minister of Public Works. It has been attached now to the Education Department, but it is uncertain whether it will remain a separate College or will be incoporated with the University of Tokio. In the latter case a considerable readjustment of the staff would take place, as the University has already professors of most of the subjects taught at the Engineering College; and a number of holders of Chairs of scientific subjects would be redundant. Commenting on this subject, the *Japan Mail* says that graduates of the College are found doing useful work in every part of the empire, and so high is the esteem in which they are held that to have been educated there is a certain passport to employment. It possesses the handsomest buildings and the most perfectly-equipped laboratories and museums of any educational institution in Japan, the University not excepted, and hence it would be a pity to destroy the individuality of an institution which has been so markedly successful. Accordingly it is suggested that the wisest plan would be to affiliate it to the University, and to transfer the engineering classes of the latter to its care. If any Japanese institution may be said to be British, the Engineering College may be said to be so from its foundation until the present moment. Its Chairs have all been held by English men of science, and are still held by them.

THE administration of the Ethnological Section of the Royal Museum at Berlin has commenced the publication of a periodical having for its object the description of the contents and additions to the collection. It is published by Spemann of Berlin. The first number contains an account of Dr. Nachtigal's ethnological collections, of those from Easter Island, a description of the burials of the Pelew Islands by Herr Kubary, also one of the ourney of the collector, Herr Rohde, in Matto Grosso and the Indian tribes of this region. Dr. Grube describes a collection of Taoist pictures; Dr. Grünwedel contributes notices of the iconography of the Lamas of Tibet and Mongolia, and Bishop Thiel supplies a vocabulary from Costa Rica. Some of the papers are illustrated by plates.

THE Christiania University has received a valuable collection of ethnographical objects from East Greenland from the Danish Government, as a mark of appreciation of the services rendered by Dr. Knutsen, a Norwegian naturalist, to the expedition under Lieut. Holm, of which he was a member.

THE well-known Norwegian *savant*, Dr. Rausch, makes in the Norwegian press an appeal respecting meteors and earthquakes which is not without interest. Respecting the former, he points out the scientific value of these objects, and describes their outward appearance when reaching the earth, with a request that a better look-out may be kept by people than has hitherto been the case. Only two meteorites have hitherto been found in Norway, viz. one in 1848 and one in 1884. Dr. Rausch is, however, of opinion that a great many more have fallen. Respecting the belief prevalent among the peasants that a stroke of lightning is preceded by a stone, said to be dark and burnt in appearance, the so-called "Thorelo," *i.e.* "Thor's wadding," and which are kept on farms as a kind of "household medicine," he ventures to suggest that they are meteorites, and begs those who may possess such to send him a small sample of the same. With regard to earthquakes he begs that a closer attention be given to their duration, extent, and the exact number of shocks, &c., than has hitherto been the case, remarking that only the most minute details will enable us to discover the origin and laws of these important phenomena.

A LETTER from Bagamoyo, published in *Cosmos*, describes a shower of stars seen there on November 27 last year. There were at the time neither moon nor clouds; the firmament was of a sombre blue. The phenomenon commenced at 7 o'clock, and the writer watched it until 9. Again he observed it at 11, and he was informed that it lasted all night. Bagamoyo is situated at 6° 23′ south, and 36° 30′ east of the meridian of Paris. Putting the average fall at eight per second, which he believes to be below the actual number, the number for the twelve hours of the night would be about 350,000 asteroids. They came from all points of the heavens, but they appeared to increase sensibly as one ascended from the horizon towards the zenith. Usually they fell singly, but sometimes a single constellation of five, eight, and ten at a time fell. Their luminous course was uniformly directed towards the south, south-east, and south-west. They did not appear to form curves, but rather to advance rapidly in straight lines. Many were like ordinary shooting-stars, but others left behind them a luminous trail of extraordinary vividness and beauty. White was the commonest colour in the train, but many had a red, yellow, and orange tint. Each lasted about a second, but some persisted for five and even ten seconds. No sound or smoke was perceived, and the phenomenon was followed by no notable change in the atmosphere. Two days after some thunder was heard and a few drops of rain fell. It is noted as curious that an old wise man on the coast had predicted shortly before that fire would fall from heaven shortly; possibly he had recognised a certain periodicity in the shower.

WE have received the first part of vol. i. of the *Annalen* of the Imperial Natural History Museum of Vienna, edited by the Director, Baron von Hauer. This part contains an account of the year's work of the Institution, the organisation of which and the arrangement of the new buildings were described in a recent number of NATURE. As the Museum includes all departments of natural history in its widest sense—geology, zoology, botany, anthropology—it will be evident that the year's work will be full of interest. This part is the first of what promises to be a series of papers issued at frequent intervals. In the next number will be papers on new species of fish from the Orinoco and Amazon, by Dr. Steindachner; on new and rare antelopes in the Museum, by Dr. Kohl; and on the flora of South Bosnia and neighbouring regions, by Dr. G. Beck.

WE referred in a previous number to ova having been artificially spawned from sea-trout, *S. trutta*, at the South Kensington Aquarium, which had been retained in captivity for three years, and had therefore not visited the sea. The ova have since become incubated, and the fry, which are hybrids, appear to be in a healthy state. The mortality amongst them is heavier than with those produced from ordinary fish, especially at the period when emerging from their shell. There is an abnormal number of monstrosities amongst them, which never live beyond a few days. The ova produced from fish in captivity occupy a longer time in hatching out than those spawned from wild fish. Owing to the severity of the weather this season, hatching operations have been greatly retarded, but the fry seem to be more vigorous and healthy in consequence.

To show the value attached to the *S. fontinalis*, or brook-trout of America, when first introduced into this country some few years since, it may be mentioned that, according to the price-lists issued by pisciculturists at the time, 100*l*. per thousand was charged for them. The same amount was mentioned for whitefish, which, until last year, were not successfully acclimatised to our waters. The price charged at the present day for the same fish is about 2*l*. per thousand.

DR. J. P. LICHERDOPOL writes under date February 23 from Bucharest (Roumania):—"Yesterday at 3.40 p.m. a slight shock of earthquake was noticed here, followed by two others strong enough to make objects hung on the walls move. Atmosphere calm, but covered with fog. No damage."

THE telephone system of Stockholm is developing rapidly: on January 15 it had 3164 subscribers, against 2335 in the beginning of 1885, and 865 in the previous year. Last year there were over 4½ million communications, of which 85,000 were by night. The subscription is about 7*l*. a year. Stockholm is connected by telephone with several neighbouring towns, the furthest being Trosa, 50 miles distant.

AT a recent meeting of the Paris Medico-Psychological Society, M. Rey (who was intrusted with documents, &c., left by Broca) gave the results of 347 observations by that eminent man on the weight of the three cerebral regions (*a*) the frontal lobes, (*b*) the occipital lobes, and (*c*) the parietal regions. In men the ratio of these parts to the brain is (*a*) 1 : 2·33, (*b*) 1 : 10·66, (*c*) 1 : 2·12. In females (*a*) 1 : 2·32, (*b*) 1 : 9·88, (*c*) 1 : 2·13. In men the left frontal lobe has more weight than the right; but the difference between the two diminishes with the weight of the whole organ. In the case of the occipital lobes and the temporal regions the right side preponderates over the left. In old men the loss of weight in the parieto-frontal regions is more sensible than that in the frontal and occipital lobes. It is still more pronounced in women; so that, while in adult age men have proportionally more in the frontal lobes, this proportion is reached by women in old age. In men the frontal lobes only attain their greatest weight at 35 years of age; but at 25 the parieto-temporal regions have their maximum weight. In women, with regard to the anterior lobes, there is little difference between 25 and 35 years of age.

MR. VAN VOORST has in the press and will very soon publish a new and enlarged edition of Prof. Mills' "Manualette" of the destructive distillation of petroleum, rosin oil, coal-tar, and kindred industries, with illustrations of shale retorts.

THE February number of *Petermann's Mittheilungen* contains a paper by Dr. Andries on the causes of the increasing number of accidents by lightning. As to the fact of the increase itself, he shows from statistics that this has, in the last fifty years, been three- to five-fold. In Bavaria the proportion is 1 to 5, and between 1854 and 1877 it has risen from 1 to 2·75 for all Germany. The question now is: Whence arises this striking increase? Various hypotheses have been advanced to account for it. Bezold refers it to varying maximum and minimum periods, the present being one of the former; Karsten attributes it to the decrease of forests, which made houses more and more the prominent points of a neighbourhood; others again allege the increase of lofty buildings, factories, and such like as the cause. Dr. Andries observes that although these may account for some of the increase, they cannot do so for all. Nor do they adequately explain the enormous and sudden increase in such a short period. He states the problem thus: "How can the electrical tension during thunderstorms be so increased that a greater number of bolts strike the earth than formerly? For it is not so much the increasing number of storms as their increased violence that causes the accidents by lightning." The main cause is said by him to be the enormous increase in the last half century in manufactories, locomotives, &c., filling the air with smoke, steam, and particles of dust of all kinds, the increase of population adding likewise to the impurity of the atmosphere. Having arrived at this point, viz. the enormous increase of foreign particles in the atmosphere, and their wide distribution by various currents of air, Dr. Andries describes at some length experiments made by himself and others on the subject, which showed that all the electrical phenomena of the air increased in intensity with the increase of dust in it, and to the same cause he attributes the increased appearances of the aurora borealis. Accidents by lightning in the southern half of the globe should, if this be correct, be much less frequent than in the other half; and this, he says, really appears to be the case. At any rate, he thinks, the southern lights are not visible nearly so frequently as those of the north.

THE additions to the Zoological Society's Gardens during the past week include eight Viscachas (*Lagostomus trichodactylus*) from Buenos Ayres, presented by Mr. E. Vere Dashwood; four American Hares (*Lepus americanus*) from North America, presented by Mr. F. J. Thompson; six Tuatera Lizards (*Sphenodon punctatus*) from New Zealand, presented by the Hon. Sir Julius Vogel, K.C.M.G.; a Macaque Monkey (*Macacus cynomolgus*) from India, fifteen Tuatera Lizards (*Sphenodon punctatus*) from New Zealand, deposited; two Yucatan Blue Jays (*Cyanocitta yucatanica*) from Yucatan, two Great Barbets (*Megalæma virens*) from the Himalayas, purchased; a Red Kangaroo (*Macropus rufus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

THE BINARY STAR γ CORONÆ AUSTRALIS.—Mr. J. E. Gore has recently computed elements of the orbit of this binary, fixing the periastron passage at 1886·53 and the period at 81·78 years. These elements differ widely from those deduced three or four years ago by Mr. Downing, who, by determining corrections to Prof. Schiaparelli's orbit, from a considerably larger number of observations than have been utilised by Mr. Gore, found the epoch of periastron passage to be 1883·203 with a period of 54·985 years. The position-angles computed from these two sets of elements now differ enormously, as is seen from the following tabular statement:—

Epoch	Angle	Distance	Computer
	°	″	
1886·0 ...	51·3 ...	1·28	Downing
1886·53 ...	48·5 ...	1·44	
1886·0 ...	200·7 ...	1·20	Gore
1886·53 ...	196·7 ...	1.13	

We venture to express the hope that those astronomers who can observe this object will not fail to do so in the present interesting stage of its physical history.

THE NEBULA ROUND MAIA.—Prof. E. C. Pickering states, in the *Astron. Nach.*, No. 2712, that the announcement of the discovery of the nebula near Maia by means of photography recalled to him the circumstance that certain peculiarities had been noticed in a photograph of the Pleiades taken at Harvard College Observatory on November 3, 1885. These were supposed at the time to be merely photographic defects, but it